How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Thomas Dunne

Final Selection Panel Review

Proposal Title

#0295: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Funding:

Fund in part
Amount: **$1,400,000**

The final Selection Panel concurred with its initial findings on this proposal and recommended funding the proposal at the reduced amount recommended as a result of those deliberations. Should the California Bay−Delta Authority accept the Selection Panel's recommendation and approve the funding of this proposal, the applicant will be allowed to negotiate which tasks and associated costs will be reduced as part of the contracting process.

Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0295: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Funding:

Fund
Amount: **$1,400,000**

Initial Selection Panel (Primary) Review

Topic Areas

- Life Cycle Models And Population Biology Of Key Species
- Environmental Influences On Key Species And Ecosystems
- Salmonid−related Projects

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

The proposed project would investigate a model of river restoration that forms the conceptual foundation for substantial investments in CALFED funds, specifically on the Merced and Tuolumne rivers and Clear Creek, as well as investments in other basins such as the Trinity River. The project would look at how these investments affect salmon and the riverine ecosystems on which they depend. The project should provide information necessary to evaluate and improve river restoration efforts throughout the Central Valley.

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the

proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

The proposed project would be a timely investigation of a dominant conceptual model for river restoration in California. CALFED has invested heavily in restructuring and rescaling rivers to adapt those rivers to altered and diminished flow regimes, with the expectation that those rivers would better support sustained production of chinook salmon and other species dependent on alluvial rivers. The project would focus on a recently completed large−scale channel reconfiguration on the Merced River. The potential for rapid gains in information is facilitated by the newness and simplicity of the Merced River channel restoration. Delaying initiation of the project would risk losing this unique opportunity.

Selection Panel (Discussion) Review

fund this amount: $**1,400,000**
note:
fund

This proposal addresses an approach to river restoration that the CALFED Bay−Delta Program has employed on several rivers in its area of concern. Successfully restoring rivers is key to CALFED's efforts to recover salmon and steelhead and other species dependent on dynamic, functioning rivers and flood plains. Studying this post−restoration project at this stage of river (re−)evolution will provide information critical to many other, similar river restoration projects.

The Panel felt that the proposed budget was too large given total overall funding available to the Science Program. The Panel felt that the budget should be trimmed to a level similar to other proposals recommended for funding in this

solicitation. The Panel recommended that the applicants work with the Science Program to reach a target budget of $1,400,000.

Panel Ranking: Fund with modifications

Technical Synthesis Panel Review

Proposal Title

#0295: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Final Panel Rating
superior

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

This project has potential to produce solid information because it is limiting the study area (reaches) to allow for better data collection and analyses. It also is asking the right questions which should lead to ultimate sustained restoration and management program first of the study reach (stream) and then more CALFED rivers. This project represents the type of interdisciplinary studies that river scientists have been asking for. It also has brought together a team that understands the CALFED issues and, in many cases, have applied adaptive management to understanding these issues.

Additional Comments:

This project has potential to produce solid information because it is limiting the study area (reaches) to allow for better data collection and analyses. It also is asking the right questions which should lead to ultimate sustained restoration and management program first of the study reach (stream) and then more CALFED rivers. This project represents the type of interdisciplinary studies that river scientists have been asking for. It also has brought together a team that

understands the CALFED issues and, in many cases, have applied adaptive management to understanding these issues.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

This proposal was reviewed by three, highly qualified external reviewers; two rated this proposal “excellent” and the third rated it “very good”. The panel was satisfied that these external reviewers provided thorough, thoughtful and substantial reviews. The project will combine intensive field surveys, experiments, and modeling to study the dynamics of riverine restoration processes at multiple physical and biological levels on the small spatial scale of a previously “restored” river reach. The panel felt that the proposal’s inter−disciplinary nature and its effort to explicitly address bio−physical interactions are its great strengths. This kind of study will likely provide valuable information to inform future stream restoration efforts. River restoration is a major focus of CBDA and so this proposal addresses a topic of central importance. Applicants present numerous solid hypotheses and the questions they intend to address are on−target. This well−written proposal describes a well−designed and well−integrated research program.

There were, however, some non−trivial concerns with certain aspects of this project. For example, in most cases the hypotheses and experiments are described well; however, in other places, the proposal reads as a “shopping list” of variables to measure and the conceptual−model that justifies these measurements and describes their relevance to specific research questions is elementary, an unexpected product from this group. The presentation sometimes assumes certain positive impacts of previous restoration activities on the study site that would have been better presented as testable hypotheses. Intensive, inter−disciplinary studies of specific sites are needed to understand restoration impacts; however, it is not clear that data collected at this site (or any one site) will be generalizeable to other restoration sites in the system.

Also, the budget is quite large and includes a large number of post−doctoral scientists (one for each task, though some tasks overlap) in addition to time for PI's and graduate students. Field sampling and modelling are treated as totally seperate tasks in the budget whereas it seems that data collection and modelling should be integrated. Field sampling/monitoring equipment are all being purchased for this project. The lack of this equipment, normally used for studies of this kind, at the applicants' universities should be documented.

Rating: Superior

Technical Review #1

proposal title: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals of this proposal are very clear and timely. All the proposed tasks will help provide a detailed picture of gemorphic process and associated biological process that is fundamental to structuring stream ecosystems.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study is justified. It seeks to advance understanding of geomorphic−biologic coupling which is critical for river restoration but if very complex and only conceptually understood at this time. The conceptual model is stated and the basis for the proposed work is to get successional and experimental data on a restoration project to better document relations and determine cause and effect between specific restoration actions and biological components. The selection of the Merced River project in the Robinson Reach is justified because it is a recently completed, large scale restoration and**

	already has a team of scientists in place that are documenting much basic information. The addition of the proposed study would benefit from what is already being collected but would complement that information greatly by providing a much higher level of detail that is rare in the study or river ecology.
Rating	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	The approach is well designed and feasible. Some of the experiments and outcomes are as yet uncertain but the focus of the study on restoration and on links between ecology and geomorphology will ensure that the work is relevant. The results will add tremendously to understanding of the impacts of the Merced River restoration and this alone is highly beneficial because few restoration projects are well evaluated. However, the information collected in this study will certainly have broad application to river restoration projects in general and to the study of river ecology. Novel information is possible particularly with the flow field mapping, detailed substrate information, and detailed macroinvertebrate data, but what would be most novel would be the integrated picture summarizing the results of the proposed study along with the results of previous and ongoing studies in the Merced River. This could become one of the most comprehensive river ecology projects in existence. The information will inform decision makers about the benefits of each component of a restoration project. It may also help detect restoration features that are of particular importance or of questionable value.
Rating	excellent

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The approach is very well documented and feaasible. The likelihood of success seems high, particularly given the prior record of the authors and the very well written and organized proposal.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**For the most part, proposed monitoring is descriptive and is appropriately designed to provide detailed knowledge of the river channel, substrate, riparian vegetation, and instream animals. Plans to interpret the monitoring data include summaries of distributions and models of physical and biological response to restoration practices.**
Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**It seems very likely that many valuable producst will come from this project. The authors carefully consider the importance to river restoration throughout California and elsewhere. All outcomes will provide useful information. Experiments and models will provide and assessment of specific restoration**

	activities that are commonplace wherever rivers are managed or restored.
Rating	**excellent**

Additional Comments

Comments	**This is a very well prepared proposal. Much better in all respects than average.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The authors have an impressive track record and is cleary qualified and used to working together. There is no reason to believe they cannot easily implement and complete the proposed study.**
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The proposed budget is large but this is due to the fine level of detail that is proposed. It appears to be reasonable and adequate.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**I find very little cause to doubt the integrity of this proposal and very much reason to be enthusiastic about it. The proposal is arranged in an orderly and**

	logical manner and all relevant information is provided. Similarly, the proposed work fits together well. Because the authors have given adequate forethought to the proposal their study will benefit greatly because they will have little wasted effort and will have prioritized data needs appropriately. This gives them a great advantage over proposals that are less well organized and often quite confused and missing important information. A good study begins with a good plan and this proposal certainly is that.
Rating	**excellent**

Technical Review #2

proposal title: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives are clearly stated, but the authors focus more generally on research questions rather than hypotheses. Investigating the interactions among abiotic and biotic components of a river ecoystem is the next step in synthetic explanatory science beyond traditional discipline−bound studies and will likely hold important keys to advancing the state of the science within disciplines (e.g. geomorphology, ecology) as well as improving our understanding of how ecosystem components influence each other.**
Rating	**very good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**More time could have been spent justifying the study relative to existing knowledge, but the authors do show how their work uses and builds on other studies through their separate project descriptions. A conceptual model is clearly delineated on Page 2, project description, and quantification of this model**

	forms the foundation of the study design. Project goals require a research project structure, as is proposed, for a successful outcome.
Rating	**very good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The authors provide sufficient detail on study design to indicate that project objectives will likely be met. The authors are candid in admitting that scientific manipulations may be constrained by current management plans, but they effectively argue that they will still be able to address main research objectives and contribute to an improved understanding of the abiotic and biotic interactions along the Merced River reach that is their study area. This work should contribute successfully to a growing understanding of river system dynamics and this project will generate novel information (fairly unique opportunity to work with a newly developing restored river reach) and methodologies (e.g. application of 2D flow field modeling). This research will be useful to decision makers because it focuses on a situation that river managers commonly face -- concern over restoration success on a river that will still be influenced human impacts (e.g. dams). In addition, managers should be very interested in this study because of its focus on the ability to establish natural river dynamics that require minimum restoration maintenance (i.e. managers time and money)over time.**
Rating	

	excellent

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The study approach is well−designed and technically feasible, but (as mentioned above) the study manipulations may be slightly constrained by current management needs (e.g. modifying existing revegetation planting schemes to meet riparian study objectives.) Restrictions on field research are relatively common when working on publicly−managed lands and valuable contributions to research can still be made. The scale of the project is appropriate given study design and the authors appear to have the expertise to carry out their aspects of the study.**
Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The authors are working with current managers of the Merced River Salmon Habitat Enhancement Program and are enhancing and expanding current monitoring and scientific measurements. The authors indicate that their is an excellent monitoring database to indicate conditions during the first few years following river restoration, but could have indicated more clearly their access to data on river reach conditions prior to restoration. This work aims to go beyond monitoring and emphasizes developing explanatory models and understanding that will advance science and provide better tools for managers.**
Rating	

	very good

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**This study will provide models and metrics based on new, high-resolution, and integrative (biotic and abiotic) data. The authors indicate that their work will contribute to the broad, ongoing data collection and management associated with the Merced River Salmon Habitat Enhancement Program. The authors have a solid history of publishing research and dissemination of the data and analysis to the broader professional community.**
Rating	**very good**

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The senior and junior authors have excellent track records for research publication and each person is assigned to tasks appropriate for their areas of expertise. The authors do not explicitely discuss the infrastructure that they can provide and their specific needs, although the budget justification provides an indication of equipment needs.**
Rating	**very good**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**This is a formidable, multidisciplinary and multiyear project. The budget reflects the substantial time commitment necessary to carry out the study and the equipment needs.**
Rating	**very good**

Overall

Provide a brief explanation of your summary rating.

Comments	**Each of the study components is a full research agenda. I applaud the authors for the goal of working together and developing one large, synthetic study. However, even with the extended page limit allowed, there was insufficient space for the authors to fully discuss their project. (Perhaps FERC should develop a better template for multidisciplinary proposals.) The overarching goal of an integrative, abiotic–biotic investigation of river dynamics is quite valuable however, and the authors appear to have an approach and the expertise to follow through on this study.**
Rating	**very good**

Technical Review #3

proposal title: How Abiotic Processes, Biotic Processes, and Their Interactions Sustain Habitat Characteristics and Functions in River Channels and their Floodplains: An Investigation of the Response of a Gravel−Bed Reach of the Merced River to Restoration

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals, objectives and hypotheses are very clearly stated and are internally consistent. Each of the four study components (hydrodynamics and geomorphology, invertebrate ecology, fish ecology and behavior, and floodplain vegetation) are structured around a series of questions and objectives that relate back to the overarching scientific question the project seeks to address. The idea of investigating relationships between abiotic and biotic processes in the context of river restoration is timely and important, directly addressing the need for a stronger scientific basis for river restoration and for stronger understanding of physical−biological process linkages in river−floodplain systems.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The study is justified and needed to fill gaps in understanding regarding abiotic−biotic process linkages in river−floodplain systems, and in**

	understanding of how rivers respond to various methods of river restoration. The proposal includes clear and concise conceptual models that set the stage both for the broad question of abiotic–biotic process linkages in river restoration and for each of the study components. This project represents the type of collaborative, interdisciplinary research incorporating geomorphology, hydrology, and ecology that river scientists have recently suggested is needed to resolve some of the uncertainties and complexities in the science underlying river management (Benda et al. 2002, BioScience 52:1127–1136; Nilsson et al. 2003, Ecosystems 6:659–674; Poff et al. 2003, Frontiers in Ecology 1:298–306). Despite recognition of the importance of interdisciplinary research, it is rare for physical and biological scientists to actually collaborate on the same project.
Rating	**excellent**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The proposed approach is very well designed and appropriate for meeting project objectives. It is evident that considerable thought and planning has gone into designing the study. The proposed study site, the Robinson reach of the Merced River, provides an outstanding opportunity to study physical and biological linkages in response to river restoration. The project may generate novel methodology and approaches, particularly in relation to combining physical and biological research on river systems and in relation to modeling these processes, although explanation of proposed modeling efforts is somewhat vague. Results will add considerably to knowledge**

	about abiotic–biotic process linkages and the responses of these processes to river restoration. This information will assist future river restoration efforts in terms of planning, prioritization, and implementation, and the authors appear to have carefully considered how to convey this information to decisionmakers. **The authors propose to use an adaptive approach to certain components of the research, such as catering data collection to sediment augmentation experiments or managed flow releases. This approach is appropriate and likely to yield useful insights in the river restoration context. The proposed research would benefit from advanced planning regarding the difficult question of data collection during high flow periods, which would appear to be an important element of addressing the research questions proposed here.** **One potential problem with the proposed approach relates to the authors' supposition that the proposed study reach is ideal for this work because it has undergone relatively little change since the implementation of the restoration project. Unfortunately for the authors, however, an extremely large amount of snowfall has occurred in the Sierra Nevada during the winter of 2004–2005, suggesting that there is potential for high flows in this reach, and potential geomorphic change, before this research is started. This is beyond the proposal authors' control of course, but may force rethinking of the basic precept of little geomorphic change since restoration. Another problem with this rationale is that the authors assume that, although geomorphic change has been slow in the last several years since restoration, the rate of change will increase during the duration of this research proposal, to a point where meaningful understanding of geomorphic change in a restored reach, and associated biotic responses, can be observed.**
Rating	

	excellent

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**With a few exceptions, the approach is well documented, technically feasible, and has a high likelihood of success in producing valuable interdisciplinary insights into river processes and restoration science. This is an extremely ambitious, large−scale interdisciplinary project requiring considerable expertise, vision, and management, but it is within the grasp of the PI's, whose capabilities are discussed further below.** **One aspect of the approach whose feasibility is difficult to gauge is the mathematical modeling proposed in several sections for generalizing results. The modeling approach is not fully explained, and it is sometimes unclear where new models will be developed or where existing models will be employed.** **Another potential feasibility issue relates to the proposed use of an acoustic Doppler current profiler to determine multi−dimensional velocity profiles and flow depths. While this is a technology that holds great promise (and great expense), its effectiveness may be less than the authors suggest, due to limitations on its use in shallow flows and in near−bank areas, and due to challenges in data processing and interpretation. The authors may wish to consider the feasibility of the ADCP for its intended uses and consider alternatives that may have both lower cost and higher reliability.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**A major component of the research proposed here is detailed monitoring of physical and biological processes following a restoration treatment on a reach of the Merced River. An intensive and ambitious data collection campaign is proposed, and postdoctoral and graduate student researchers will be based in the field area to carry out this campaign. The authors propose appropriate methods for this data collection, and the authors indicate that they will take advantage of existing pre−and post treatment data collected by agency personnel. Details of what type of monitoring work has been and will be performed on the Merced by other agencies or entities are vague however, making it somewhat difficult to judge how successful collaboration and integration of existing work will be, although the involvement of Faulkenberry will likely facilitate successful integration.**
Rating	**excellent**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**The proposed research will result in valuable basic and applied knowledge. Each component of the proposed research includes mathematical modeling to generalize results. Given the breadth of the research questions proposed here and the strong publication records of the**

	PI's, it is likely that numerous scientific papers will be produced in peer-reviewed journals. It is also likely that the results of this work will be disseminated to river managers and restoration practitioners and will help guide future restoration efforts. The inclusion of a CDWR scientist as a PI (Faulkenberry) will assist efforts to incorporate the knowledge produced by this work into future river management. In addition, the authors propose to participate in workshops, field meetings, and planning sessions with agency personnel to communicate results and to coordinate with ongoing studies.
Rating	**excellent**

Additional Comments

Comments	**Overall this is a well written, clear proposal. But, it is a bit sloppy in spots—it is obvious that a spell check was not performed, and language is occasionally sloppy. At least one reference (Brookes and Shields 1994) is cited in the text but not listed in the reference list; in addition, I suspect the date on that reference should be 1996. The format used is not consistent throughout the proposal; section C. uses slightly different formatting.**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**The authors have an outstanding track record in their respective fields and are excellently qualified to implement the project. Several of the more senior PI's are considered leaders in their respective fields and**

	bring considerable credibility and experience to the project. The project leader (Dunne) is particularly well respected in the field of geomorphology and has received received numerous awards and honors for his contributions to knowledge of fluvial and hillslope processes. The inclusion of the CDWR project leader on implementation of the Merced project (Faulkenberry) will assist integration of this research with ongoing efforts, and will help ensure dispersal of the knowledge resulting from this work to relevant agencies. The project team has some of the necessary infrastructure in place, and request considerable funding in the budget to create the necessary infrastructure. Because a substantial portion of the work on this project, including modeling, will be performed by postdoctoral researchers, the qualifications of whomever ends up filling these positions will influence the success of the project. It is likely that given the stature of PI's and the subject matter of the project that highly qualified postdoctoral researchers will be found.
Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The proposed budget includes salary for a small army of undergraduate assistants, 5 postdocs, support staff, summer salary for professors, a considerable amount of high−tech equipment, liberal add−ons and expenses, and indirect costs. The proposal is deserving of a considerable amount of funding, but the proposed budget does not reflect any effort to be parsimonious. For example, funds are requested for a broad array of new field equipment (e.g., a $30,000 pickup truck), and some tasks include considerable funding for a field apartment (approximately $56,000 total) while others request separate funding for lodging at the field site. Some items in the budget**

	are overly vague: e.g., $12,000 for “field sampling gear”. Although the budget could be scaled back somewhat, this research is nevertheless deserving of a substantial budget.
Rating	**very good**

Overall

Provide a brief explanation of your summary rating.

Comments	**Completion of this research would produce valuable and needed insights into several aspects of river science, including geomorphology, hydrodynamics, fish ecology and population dynamics, macroinvertebrate ecology, and riparian vegetation and floodplain dynamics. Each of the research tasks outlined in this proposal has merit individually. Combined together, the proposed work represents the type of interdisciplinary collaboration between physical and biological scientists that is capable of producing synergistic results and that is needed to advance river science and to guide future restoration efforts. It if is evident that considerable planning and thought went into this proposal, resulting in the development of important and ambitious research questions, well designed and feasible research approaches grounded in clear conceptual models, plans for disseminating information to scientists and decisionmakers, and assembly of an outstanding research team.**
Rating	**excellent**